

What Is Claimed Is:

1. An apparatus for assessing physiological function in an individual comprising:

5 a sensor, said sensor comprising:

a stimulator shaped to fit a first anatomical site, said stimulator generating a stimulus whereby application of said stimulus stimulates a nerve at said first anatomical site; and

10 a detector shaped to fit a second anatomical site, said detector comprising a plurality of electrodes for detecting a signal generated in response to said stimulus;

15 wherein said sensor automatically positions said detector substantially adjacent to said second anatomical site when said stimulator is positioned substantially adjacent to said first anatomical site;

20 and further wherein said sensor comprises a processor for processing said at least one signal from said detector to select at least one electrode detecting at least one signal characteristic of said anatomical site.

2. An apparatus for assessing physiological function in an individual comprising:

a sensor, said sensor comprising:

5 a stimulator shaped to fit a first anatomical site, said stimulator generating a stimulus whereby application of said stimulus stimulates a nerve at said first anatomical site; and

10 a detector shaped to fit a second anatomical site, said detector comprising a plurality of electrodes for detecting a signal generated in response to said stimulus;

15 wherein said sensor comprises a processor for processing said at least one signal from said detector to select at least one electrode detecting at least one signal characteristic of said anatomical site.

3. An apparatus for assessing physiological function in an individual comprising:

a sensor, said sensor comprising:

20 a stimulator shaped to fit a first anatomical site, said stimulator generating a stimulus whereby application of said stimulus stimulates a nerve at said first anatomical site; and

a detector shaped to fit a second anatomical site, said detector comprising a plurality of electrodes for detecting a signal generated in response to said stimulus;

5 wherein said sensor automatically positions said detector substantially adjacent to said second anatomical site when said stimulator is positioned substantially adjacent to said first anatomical site.

10 4. The apparatus of claim 3 wherein said sensor is shaped to fit a lower extremity of said individual.

5. The apparatus of claim 4 wherein said lower extremity comprises the foot.

15 6. The apparatus of claim 3 further comprising a processor, said processor for processing said at least one signal from said detector to select at least one electrode detecting at least one signal characteristic of said anatomical site.

20 7. The apparatus of claim 3 wherein said physiological function comprises nerve conduction.

8. The apparatus of claim 7 wherein said nerve conduction comprises conduction of the tibial nerve.

5 9. The apparatus of claim 7 wherein said nerve conduction comprises conduction of the peroneal nerve.

10 10. The apparatus of claim 3 wherein said stimulator comprises a shape to fit said first anatomical site, wherein said first anatomical site comprises a superficial location over the peroneal nerve, and said detector comprises a shape to fit said second anatomical site, wherein said second anatomical site comprises a superficial location over the extensor digitorum brevis muscle of the foot.

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20 11. The apparatus of claim 3 wherein said stimulator comprises a shape to fit said first anatomical site, wherein said first anatomical site comprises a superficial location over the tibial nerve, and said detector comprises a shape to fit said second anatomical site, wherein said second anatomical site

comprises a superficial location over the abductor  
hallucis muscle of the foot.

12. The apparatus of claim 3 wherein said first  
5 anatomical site comprises the ankle ipsilateral to said  
second anatomical site.

13. The apparatus of claim 3 further comprising a  
10 positioning indicator for location over a third  
anatomical site.

14. The apparatus of claim 11 wherein said third  
15 anatomical site comprises the malleolus of the ankle  
joint.

15. The apparatus of claim 14 wherein said  
malleolus is ipsilateral to said second anatomical  
site.

20 16. The apparatus of claim 3 wherein said  
detector is physically connected to said stimulator by  
a semi-flexible connector.

17. The apparatus of claim 16 wherein said connector comprises a strip comprising electrical traces for signaling between said detector and said stimulator.

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18. The apparatus of claim 3 wherein said electrodes comprise an electrode array in communication with a processor.

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19. The apparatus of claim 18 wherein said electrode array comprises at least two independent interleaved bipolar recording elements.

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20. The apparatus of claim 3 wherein said signal comprises a compound muscle action potential.

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21. The apparatus of claim 20 wherein said compound muscle action potential is recorded over a motor point.

22. The apparatus of claim 3 wherein the weighted sum of the recordings of at least two electrodes comprises the detectable signal.

23. A method for assessing physiological function in an individual, comprising:

(a) placing a sensor on an individual, said  
5 sensor comprising:

a stimulator shaped to fit a first anatomical site, said stimulator generating a stimulus whereby application of said stimulus stimulates a nerve at said first anatomical site; and

10 a detector shaped to fit a second anatomical site, said detector comprising a plurality of electrodes for detecting at least one signal generated in response to said stimulus;

15 wherein said sensor automatically positions said detector substantially adjacent to said second anatomical site when said stimulator is placed substantially adjacent said first anatomical site on the surface of an individual; and

20 (b) performing nerve conduction studies with at least one electrode to assess physiological function in an individual.

24. The method of claim 23 further comprising:

(c) processing said at least one signal generated at said second anatomical site to select at least one electrode detecting said at least one signal characteristic of said second anatomical site;

5 (d) selecting at least one electrode in response to said processing according to step (c) from said plurality of electrodes; and

(e) performing nerve conduction studies of step (b) with said at least one electrode selected in step (d).

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25. The method of claim 23 wherein said nerve conduction studies comprise measurement of an F-wave latency.

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26. The method of claim 23 wherein said nerve conduction studies comprise measurement of a motor latency.

20 27. The method of claim 23 wherein said nerve conduction studies comprise measurement of a sensory latency.



28. The method of claim 23 wherein said nerve conduction studies comprise measurement of a sensory amplitude.

5           29. The method of claim 24 wherein processing further comprises amplitude comparison between a plurality of signals generated at said second anatomical site.

10           30. The method of claim 24 wherein processing comprises frequency spectrum comparison between a plurality of signals generated at said second anatomical site.

15           31. The method of claim 23 wherein said at least one signal generated at said second anatomical site comprises peripheral evoked potentials.

20           32. The method of claim 29 wherein said amplitude comparison comprises maximal peak to peak amplitude.

33. The method of claim 30 wherein said frequency spectrum comparison comprises discrete Fourier

transform analysis of said plurality of signals generated at said second anatomical site and comparison of the spectral components.

5           34. The method of claim 33 wherein said selected electrodes comprise electrodes with more energy at low frequencies.

10           35. The method of claim 23 wherein said at least one signal generated at said second anatomical site comprises compound muscle action potential.

15           36. The method of claim 23 wherein said at least one signal generated at said second anatomical site is recorded over a motor point.

37. An apparatus for assessing physiological function in an individual, comprising:

20           stimulus means for producing a stimulus and for applying the stimulus at a first anatomical site whereby a nerve is stimulated;

          detecting means comprising a plurality of electrodes for detecting at least one signal

characteristic of a second anatomical site generated in response to said stimulus; and

connecting means for connecting said stimulus means and said detecting means wherein said connecting means automatically position said detecting means substantially adjacent said second anatomical site when said stimulating means are positioned substantially adjacent first anatomical site.

38. The apparatus of claim 37 further comprising:  
processing means for processing said at least one signal from said detecting means.